



## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Baudenbacher, et al.

Title: SUPERCONDUCTING QUANTUM  
INTERFERENCE APPARATUS AND  
METHOD FOR HIGH RESOLUTION  
IMAGING OF SAMPLES

Appl. No.: 10/650,263

Filing Date: August 27, 2003

Examiner: Kenneth J. Whittington

Art Unit: 2862

## CERTIFICATE OF EXPRESS MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as Express Mail in an envelope addressed to: MAIL STOP PETITION, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450, on the date below.

EV 611362038 US  
Express Mail Label No.

3/31/2005

(Date of Deposit)

Bernard L. Kleinke

(Printed Name)

(Signature)

**PETITION TO CORRECT FILING DATE OF  
REPLY AND AMENDMENT UNDER 37 CFR § 1.8**

MAIL STOP PETITION  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Dear Sir:

Request is hereby made to correct the response date of the subject REPLY AND AMENDMENT from March 10, 2005 to March 8, 2005, in the above-mentioned utility patent application.

On March 8, 2005, the subject REPLY AND AMENDMENT was deposited in a First Class Mail box at Midway Post Office, 2535 Midway Drive, San Diego, CA 92110-9998, at approximately 7:00 p.m., before the last pickup of 7:30 p.m., via U.S. First Class Mail, bearing a Certificate of Mailing for First Class Mail, which specified a mailing date of March 8, 2005. A copy of the AMENDMENT TRANSMITTAL (Exhibit A), a copy of the REPLY AND AMENDMENT

04/05/2005-MBIZUNES-00000100-10650263

-01-FC:1464

130.00-OP

Adjustment date: 04/06/2005-MBIZUNES-  
04/05/2005-MBIZUNES-00000100-10650263  
01-FC:1464 130.00-OP

04/06/2005 MBIZUNES 00000002 502635 10650263

01 FC:1462

270.00 DA

130.00 OP

(Exhibit B), and a copy of the INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.56 (Exhibit C) each bear a Certificate of Mailing for First Class Mail, which specified the mailing date of March 8, 2005.

According to the 37 CFR §1.8, in part: "(1) Correspondence will be considered as being timely filed if: (i) The correspondence is mailed or transmitted prior to expiration of the set period of time by being: (A) Addressed as set out in § 1.1(a) and deposited with the U.S. Postal Service with sufficient postage as first class mail; ...(ii) The correspondence includes a certificate for each piece of correspondence stating the date of deposit or transmission. The person signing the certificate should have reasonable basis to expect that the correspondence would be mailed or transmitted on or before the date indicated...."

According to 37 CFR § 1.8, the Applicants met the following requirements:

- Addressed the envelope to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
- Envelope was weighed and adequate postage placed on the upper right-hand corner of the front of the envelope.
- Deposited in the First Class Mail box at Midway Post Office, 2535 Midway Drive, San Diego, CA 92110-9998, at approximately 7:00 p.m., before the last pickup of 7:30 p.m.
- The enclosures entitled AMENDMENT TRANSMITTAL, REPLY AND AMENDMENT, and INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.56, bearing a Certificate of Mailing for First Class Mail, which specified the mailing date of March 8, 2005.
- The undersigned Attorney, Bernard L. Kleinke, deposited the envelope in a First Class Mail box at Midway Post Office, 2535 Midway Drive, San Diego, CA 92110-9998, at approximately 7:00 p.m., before the last pickup of 7:30 p.m.

Thus, the REPLY AND AMENDMENT was timely filed by March 8, 2005, and the response date should have been March 8, 2005.

In view of the foregoing remarks, the Applicants believe that they have complied with the filing requirements in a timely manner, set forth in 37 CFR §1.8 for the subject REPLY AND AMENDMENT.

I attest that I have firsthand knowledge of the facts and I further declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any trademark issuing.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date: 3-31-2005

By: Bernard L. Kleinke

DUCKOR SPRADLING METZGER & WYNNE  
A Law Corporation  
401 West A Street, Suite 2400  
San Diego, CA 92101-7915  
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Bernard L. Kleinke  
Attorney for Applicants  
Registration No. 22,123

**AUTHORIZATION TO PAY AND PETITION FOR THE  
ACCEPTANCE OF ANY NECESSARY FEES**

The Commissioner is hereby authorized to charge any additional fees which may be required either now or in the future regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. If any charges or fees must be paid in connection with the foregoing, concurrent or future communication (including, but not limited to, the payment of an extension fee or issue fees), or if any overpayment is to be refunded in connection with the above-identified application, any such charges or fees, or any such overpayment may be respectfully paid out of, or into, the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. If any such payment also requires a petition or extension request, please construe this authorization to pay as the necessary petition or request, which is required to accompany the payment.

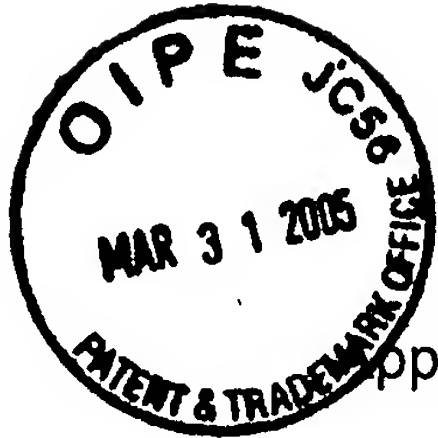
Respectfully submitted,

Date: 3-31-2005

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A Law Corporation  
401 West A Street, Suite 2400  
San Diego, CA 92101-7915  
Telephone: 619.231.3666  
Facsimile: 619.231.6629  
Email: [kleinke@dsmwlaw.com](mailto:kleinke@dsmwlaw.com)

By: 

Bernard L. Kleinke  
Attorney for Applicants  
Registration No. 22,123



Atty Docket No. 9278-100

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Baudenbacher, et al.

Title: SUPERCONDUCTING QUANTUM  
INTERFERENCE APPARATUS AND  
METHOD FOR HIGH RESOLUTION  
IMAGING OF SAMPLES

Appl. No.: 10/650,263

Filing Date: August 27, 2003

Examiner: Kenneth J. Whittington

Art Unit: 2862

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Express Mail Label No.

3/31/2005

(Date of Deposit)

Bernard L. Kleinke

(Printed Name)

*Bernard L. Kleinke*  
(Signature)

**PETITION TO CORRECT FILING DATE OF REPLY AND AMENDMENT  
UNDER 37 CFR § 1.8 TRANSMITTAL**

MAIL STOP PETITION  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Dear Sir:

Transmitted herewith is:

- ☒ PETITION TO CORRECT FILING DATE OF REPLY AND AMENDMENT  
UNDER 37 CFR § 1.8 with Exhibits A-C
- ☒ Credit Card Payment Form for Petition
- ☒ Return receipt postcard

- ☒ The Commissioner is hereby authorized to charge any additional fees which may be required either now or in the future regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. If any charges or fees must be paid in connection with the foregoing, concurrent or future communication (including, but not limited to, the payment of an extension fee or issue fees), or if any overpayment is to be refunded in connection with the above-identified application, any such charges or fees, or any such overpayment may be respectfully paid out of, or into, the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. If any such payment also requires a petition or extension request, please construe this authorization to pay as the necessary petition or request, which is required to accompany the payment.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date: 3-31-2005

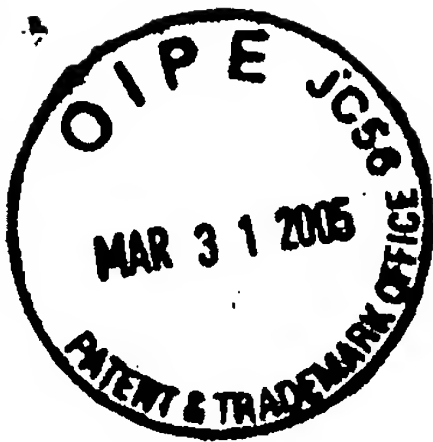
By: Bernard L. Kleinke

DUCKOR SPRADLING METZGER & WYNNE  
A Law Corporation  
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San Diego, California 92101-7915

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Email Address: [kleinke@dsmlaw.com](mailto:kleinke@dsmlaw.com)





App. No. 10/650,263  
Amdt. Dated ~~February 8, 2005~~ <sup>March</sup> 8, 2005  
Reply to Office Action of December 8, 2004  
Atty. Dkt. No. 9278-100 (formerly 9129-111)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Baudenbacher, et al.

Title: SUPERCONDUCTING QUANTUM  
INTERFERENCE APPARATUS AND  
METHOD FOR HIGH RESOLUTION  
IMAGING OF SAMPLES

Appl. No.: 10/650,263

Filing Date: August 27, 2003

Examiner: Kenneth J. Whittington

Art Unit: 2862

**CERTIFICATE OF FIRST CLASS MAILING**  
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22313-1450.

3/8/2005  
Date of Deposit)

Bernard L. Kleinke  
(Printed Name)

Bernard L. Kleinke  
(Signature)

AMENDMENT TRANSMITTAL

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Transmitted herewith is an Amendment and Information Disclosure Statement in  
the above-identified application.

[ X ] Small Entity status under 37 C.F.R. § 1.9 and § 1.27 has been established.

[ X ] The fee required for additional claims is calculated below:

	Claims as Amended	Previously Paid For	Extra Claims Present	Rate	Additional Claims Fee
Total Claims:	39	21	= 18	x \$ 50.00	= \$900.00
Independents:	4	3	= 1	x \$200.00	= \$200.00
First presentation of any Multiple Dependent Claims:			+	\$360.00	= \$0.00
				CLAIMS FEE SUBTOTAL:	= \$1,100.00
<input checked="" type="checkbox"/>				Small Entity Fees Apply (subtract 1/2 of above):	= \$550.00
				CLAIMS FEE TOTAL:	= \$550.00
Information Disclosure Statement					\$180.00
				TOTAL FEES	\$730.00

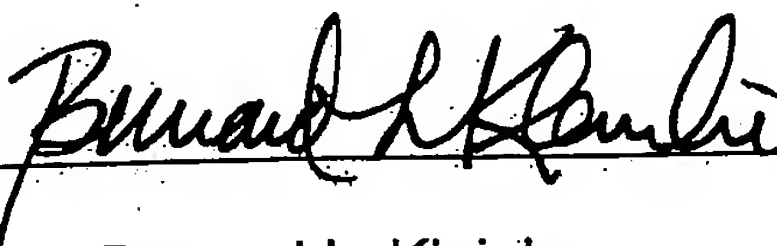
Adjustment date: 04/06/2005 MBIZUNES  
-04/05/2005-MBIZUNES 00000100 10650263  
01-FC:1464 -130.00 OP

- [X] A Credit Card Payment Form in the amount of \$730.00 is enclosed.
- [X] The Commissioner is hereby authorized to charge any additional fees which may be required either now or in the future regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. If any charges or fees must be paid in connection with the foregoing, concurrent or future communication (including, but not limited to, the payment of an extension fee or issue fees), or if any overpayment is to be refunded in connection with the above-identified application, any such charges or fees, or any such overpayment may be respectfully paid out of, or into, the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. If any such payment also requires a petition or extension request, please construe this authorization to pay as the necessary petition or request, which is required to accompany the payment.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

By:



Bernard L. Kleinke  
Attorney for Applicant  
Registration No. 22,123

Date: March 8, 2005

DUCKOR SPRADLING METZGER & WYNNE  
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App. No. App. No. 10/650,263  
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<u>3/8/2005</u>	
Bernard L. Kleinke (Printed Name)	
<u>Bernard L. Kleinke</u> (Signature)	

**REPLY AND AMENDMENT**

Commissioner for Patents  
P.O. BOX 1450  
Alexandria, VA 22313-1450

Sir:

In response to the Office Action of December 8, 2004, please amend the above-identified application as follows:

**Amendments to the Specification** begin on page 2 of this paper.

**Amendments to the Claims** begin on page 6 of this paper.

**Amendment to the Drawings** begin on page 13 of this paper and in an attachment to this paper.

**Amendments to the Abstract** begin on page 14 of this paper.

**Remarks/Arguments** begin on page 15 of this paper.

**AMENDMENTS TO THE SPECIFICATIONS:**

Please replace Paragraph [0057] of US Publication No. 2004/0145366A1 with the following amended paragraph:

[0057] FIG. 2a is a diagrammatic cross-sectional view of a tip of the microscope;

Please replace Paragraph [0058] of US Publication No. 2004/0145366A1 with the following amended paragraph:

[0058] FIG. 2b [[3]] is a scanning election microscope image of a pick-up coil for the microscope of FIG. 1;

Please replace Paragraph [0103] of U.S. Publication No. US 2004/0145366A1 with the following amended paragraph:

[0103] In order to obtain high spatial resolutions the sensor is placed in close proximity to the room temperature sample for some applications, typically at distances comparable to the spatial resolution. (See the Wikswo, et al. article). Hence the major challenges are to bring and maintain a close spacing between the sensor at low temperature (about 4.2 K) and the sample at room temperature. Therefore, the sensor is placed in the vacuum space behind a thin sapphire window. The sensor is maintained at cryogenic temperatures in the vacuum space in close proximity to the room temperature sapphire window. The sample is scanned in close proximity to the window. The instrument is magnetically shielded from environmental noise.

Please replace Paragraph [0104] of US Publication No. 2004/0145366A1 with the following amended paragraph:

[0104] Referring now to the drawings and more particularly to FIG. 1 thereof, there is shown a low-temperature SQUID microscope 10, which is constructed according to preferred embodiment of the invention. The microscope 10 includes a dewar 12 contains two stacked reservoirs 14 and 16. The lower reservoir 14 contains liquid helium and the upper reservoir 16 contains liquid nitrogen. The 3.2 liter

nitrogen tank or reservoir 14 is thermally linked to an aluminum radiation nitrogen shield generally indicated at 18 that surrounds the 1.9 liter helium reservoir 14 and extends downwardly to the tip or distal end 21 of the cryostat or cold finger 23, shielding the interior against thermal radiation from the surrounding walls. By having the shield 18 extend to the tip 21, a SQUID pick-up coil 24 is facilitated to be positioned in a closely spaced relationship to a room-temperature sample to be inspected. The nitrogen shield 18 is further wrapped in multiple layers of aluminized mylar superinsulation to reduce the thermal load due to radiation on the liquid nitrogen shield and therefore makes the operation of the sensor possible and also increases the hold time of the nitrogen contained in the reservoir. The helium reservoir 14 is supported by its fill tube 25, which provides a rigid mechanical connection to a top plate 27. Similarly, the nitrogen reservoir 16 44 is attached to the top plate 27 by its fill tube, and a flexible brass bellows 29 is connected at the bottom of the reservoir to help avoid mechanical stress due to differential thermal contraction. To help add more mechanical stability to the nitrogen reservoir 16 44 and the shield 18, there are a plurality of horizontal glass fiber rods such as rods 38 and 41. The heat load on the helium reservoir 14 imposed by the mechanical support structure is about 20 mW. The glass fiber rods contribute about 10 mW, and the fill tube 25 and nitrogen reservoir or tank 16 approximately 5 mW each.

Please replace Paragraph [0108] of U.S. Publication No. 2004/0145366A1 with the following amended paragraph:

[0108] Once the pickup coil 24 is superconducting and exhibits a response to the dc magnetic field, the white flux noise level may be about  $4 \mu\text{O}/\text{Hz}^{-1/2}$ , indicating negligible noise contributions from the pickup coil 24 or surrounding metallic structures. The conical aluminum nitrogen shield extension 54 surrounding the pickup coil 24 may may include a plurality of longitudinally extending slots such as slots 56 and 58 (FIG. 2a), in order to prevent or reduce circular currents in the plane of the pickup coil. The cone extension 54 may be composed of aluminum material, or of a machined G-10 fiber-composite material, or coil foil. When composed of the G-10 fiber-composite material, thin copper strips may be



anchored to the lower part of the nitrogen shield. Calculations demonstrated that the Nyquist noise contribution (see the Clem article) of the cold finger, nitrogen shield, window mechanism, and cryogen tanks was less than the intrinsic noise levels of the SQUID apparatus coupled to the pickup coil.

Please replace Paragraph [0153] of US Publication No. 2004/0145366A1 with the following amended paragraph:

[0153] For the purpose of the experiment, the MCGs were acquired at 1600 locations on the surface spaced 400  $\mu\text{m}$  apart on a 16 times 16 mm sup. 2 grid with the stimulation electrode in the center of the grid. FIG. 12(b) 11(b) shows a representative MCG taken at a location of the scanning grid. FIG. 12(a) 11(a) shows the scanning area on the heart diagrammatically. As shown in FIG. 11(a) 12(a), the left ventricular free wall was chosen since the cardiac muscle fiber orientation is relatively homogeneous and straight although the fiber rotates by 90 degree. from the epi- to the endocardial surface over a depth of approx. 3 mm.;

Please replace Paragraph [0155] of US Publication No. 2004/0145366A1 with the following amended paragraph:

[0155] The MCGs were combined to produce a time series of two-dimensional magnetic field maps spaced 1 ms in time. The magnetic field map during the cathodal stimulation is shown in FIG. 12 13. The magnetic field clearly shows a octopolar pattern with the magnetic field pointing out of the page in quadrants I and III and with an opposite direction in quadrants II and IV. The peak field is about 2.3 nT and the fiber direction is along the x-axis of the image. A current pattern is overlaid on the magnetic field data to visualize qualitatively the currents during stimulation. To calculate the currents from the magnetic field maps, we made as a first-order approximation the assumption that the current distribution [10] is two dimensional. It is clear that the magnetic field is generated by four current loops of alternating directions, consistent with this assumption.

Please replace Paragraph [0156] of US Publication No. 2004/0145366A1 with the following amended paragraph:

[0156] The magnetic field maps at 1, 5, 11 and 17 ms after the stimulation are shown in FIG. 1314. The magnetic field maps after the stimulus shows a reversal in currents immediately after current injection and subsequently the generation and propagation of an elliptical action-current wave front pushing the four current loops outward. At times greater than about 8 ms the four loops begin to disappear and a dominant wave front forms in quadrant III and IV.

**AMENDMENTS TO THE CLAIMS:**

1. (Currently amended) An apparatus for high resolution imaging of a sample, comprising:

a SQUID evacuated dewar;

a SQUID sensor cooperating with the dewar to sense magnetic flux from the sample being imaged; said sensor having a detection coil;

a cold finger;

said dewar having a thin window;

means for mounting the sensor remotely from the coil;

the detection coil being electrically connected to the SQUID sensor;

a mechanism for mounting the detection coil at the distal end of the cold finger in close proximity to the thin window; ~~and~~

a radiation shield mounted within the dewar and having an extension surrounding the detection coil to help maintain its cold temperature; and

wherein the extension prevents or reduces circular currents in the plane of the  
detection coil.

2. (Currently amended) An apparatus according to claim 1, further including a ~~thick~~  
thick backing window overlying the thin window on the vacuum side thereof.



3. (Currently amended) An apparatus according to claim 2, wherein said thick backing window includes a hole therein for receiving the detection coil and the distal end of the shield extension.
4. (Original) An apparatus according to claim 3, wherein the shield extension is conical and the window hole is tapered.
5. (Original) An apparatus according to claim 1, wherein the thin window is composed of sapphire material.
6. (Currently amended) An apparatus according to claim ~~[[1]]~~2, wherein the thick backing window is composed of sapphire material.
7. (Original) An apparatus according to claim 1, further including a positioning mechanism for moving the detection coil adjustably toward and away from the thin window along a substantially straight path of travel.
8. (Original) An apparatus according to claim 7, wherein the positioning mechanism includes a lever.
9. (Original) An apparatus according to claim 8, wherein said positioning mechanism includes a flexure bearing.
10. (Original) An apparatus according to claim 1, wherein said detection coil is a bare SQUID magnetometer.
11. (Original) An apparatus according to claim 10, wherein said detection coil is an all-thin film SQUID magnetometer.

12. (Original) An apparatus according to claim 1, wherein said detection coil is a magnetometer coil connected to a SQUID sensor.

13. (Original) An apparatus according to claim 1, wherein said detection coil is a first derivative gradiometer.

14. (Original) An apparatus according to claim 1, wherein said detection coil is an asymmetric gradiometer.

15. (Original) An apparatus according to claim 1, wherein said detection coil is an apodized magnetometer coilgradiometer.

16. (Original) An apparatus according to claim 1, wherein said detection coil is a vector magnetometer.

17. (Original) An apparatus according to claim 1, wherein said detection coil is a gradiometer.

18. (Original) An apparatus according to claim 1, wherein said detection coil is a fractional turn SQUID magnetometer.

19. (Currently amended) A method of high resolution imaging of a sample, comprising:  
sensing magnetic flux from the sample using a SQUID evacuated dewar and a SQUID sensor having a detection coil;

mounting the SQUID sensor within the dewar remotely of the detection coil;

mounting the detection coil at the distal end of a cold finger in close proximity to a thin window forming a part of the dewar; and

mounting a radiation shield having an extension within the dewar and surrounding the detection coil; and

using the extension to prevent or reduce circular currents in the plane of the detection coil via the extension.

20. (Original) A method according to claim 19, further including replacing the detection coil with another detection coil.

21. (Original) A method according to claim 19, further including a magnetic field to the sample being imaged prior to or during said sensing.

22. (New) An apparatus according to claim 1, wherein the extension includes at least one longitudinally extending slot.

23. (New) An apparatus according to claim 22, wherein

the extension being generally conical in shape; and

the upper portion of the extension being larger than the lower portion of the extension.

24. (New) An apparatus according to claim 1, wherein the extension is composed of aluminum.

25. (New) An apparatus according to claim 1, wherein the extension is composed of coil foil.

26. (New) An apparatus according to claim 1, wherein the extension is composed of G-10 fiber composite for reducing circular currents in the plane of the detection coil.

27. (New) An apparatus according to claim 1, further including a cold finger reservoir and a radiation shield reservoir.
28. (New) An apparatus according to claim 27, wherein the cold finger reservoir contains liquid helium.
29. (New) An apparatus according to claim 27, wherein the radiation shield reservoir contains liquid nitrogen.
30. (New) An apparatus according to claim 27, wherein the radiation shield surrounds the cold finger reservoir and the radiation shield reservoir.
31. (New) An apparatus according to claim 27, wherein the radiation shield reservoir is disposed above the cold finger reservoir.
32. (New) An apparatus according to claim 1, further including a bobbin having a tip; and a material disposed on the bobbin tip for cooling the pickup coil below the transition temperature.
33. (New) An apparatus according to claim 32, wherein the material is aluminum Mylar.
34. (New) An apparatus for high resolution imaging of a sample, comprising  
a SQUID evacuated dewar;  
a SQUID sensor mounted within the dewar for sensing magnetic flux from the sample being imaged;  
a cold finger;

the dewar having a thin window;

a detection coil electrically coupled to the SQUID sensor;

means for mounting the detection coil at the tip of the cold finger in close proximity to the thin window;

a radiation shield mounted within the dewar and having an extension surrounding the detection coil;

a first reservoir for cooling the cold finger to a first temperature;

a second reservoir for cooling the radiation shield to a second temperature;

wherein the first temperature is substantially lower than the second temperature.

35. (New) An apparatus according to claim 34, wherein the first reservoir contains liquid helium.

36. (New) An apparatus according to claim 34, wherein the second reservoir contains liquid nitrogen.

37. (New) An apparatus according to claim 34, wherein the radiation shield surrounds the first and second reservoirs.

38. (New) A method according to claim 19, further including cooling the cold finger via a first reservoir at one temperature and cooling the radiation shield via a second reservoir at a substantially higher temperature.

39. (New) A method of high resolution imaging of a sample, comprising

sensing magnetic flux from the sample using a SQUID evacuated dewar and a SQUID sensor having a detection coil electrically coupled thereto;

mounting the SQUID sensor within the dewar;

mounting the detection coil at the end of a cold finger in close proximity to a thin window forming a part of the dewar;

mounting a radiation shield within the dewar and extending to the detection coil;

cooling the cold finger to a first temperature; and

cooling the radiation shield to a second temperature; and

wherein the first temperature is lower than the second temperature.



**AMENDMENTS TO THE DRAWINGS:**

The attached drawing sheets include changes to Figure 1 and Figure 5. These sheets replace their respective original sheets. In Figure 1, previously omitted reference character 52 has been added, and in Figure 2, previously omitted reference character 87 has been added.

Attachments: Replacement sheet for Figure 1

Annotated sheet showing changes for Figure 1

Replacement sheet for Figure 5

Annotated sheet showing changes for Figure 5

**AMENDMENTS TO THE ABSTRACT:**

Please replace the Abstract with the following amended paragraph:

A method and apparatus performs ~~are disclosed~~ for high resolution imaging. The disclosed apparatus includes a low temperature SQUID sensor mounted in close proximity to a dewar thin window. A radiation shield has an extension surrounding the detection coil.

### REMARKS/ARGUMENTS

This reply is responsive to an Office Action mailed on December 8, 2004. Claims 1-21 were pending in the application.

Independent claims 1 and 19 and dependent claims 2, 3 and 6 have been amended to clarify the language of the claims. The amendments to the claims were made to render them more clear and definite and to emphasize the patentable novelty thereof. There is no intention of surrendering equivalence.

New claims 22-39 have been added to emphasize the patentable novelty of the invention and are directed to an apparatus and method for high resolution imaging of a sample, and include cooling the cold finger and the radiation shield to two different temperatures.

Please note that all paragraph citations for the Applicants' specification for the above-identified application refer to the paragraphs numbers as published in U.S. Publication No. 2004/0145366A1 and not the paragraph numbers in the Applicants' originally filed application.

### PRIOR ART REFERENCES

The Office Action requires the Applicants to provide a copy of each of the art references/articles referred to in the disclosure from pages 1-4. An Information Disclosure Statement accompanies this Reply and Amendment to include copies of the readily available art references/articles. Some of these references/articles are not readily available. The Applicants are in the process of obtaining copies of the remaining references and anticipate providing copies of these references within the next few weeks.

## INFORMATION DISCLOSURE STATEMENT

An Information Disclosure Statement and Form 1449 accompany this Reply and Amendment for filing, containing reference to a U.S. patent disclosed in the Applicants' specification and a number of articles cited in the Applicants' disclosure from pages 1-4. These references/articles were not previously cited in any previously filed Information Disclosure Statement.

The Applicants will provide an additional Information Disclosure Statement and Form 1449 for the remaining references/articles cited in the Applicant's Disclosure from pages 1-4 when the remaining references/articles are located. It is anticipated this will be completed within a few weeks of this Reply and Amendment.

## ABSTRACT

The abstract of the disclosure has been objected to because line 1 contains words that are implied, namely "are disclosed." The abstract has been amended to remove the words, "are disclosed." The abstract is now in proper form and in compliance with MPEP 608.01(b).

## SPECIFICATION

The disclosure has been objected to because of a number of informalities. As such, the Applicants have amended paragraph [0103] to clarify that, "The instrument is magnetically shielded from environmental noise." The Applicants have also clarified the Brief Drawing Description for FIGS 2a and 2b by amending paragraphs [0057] and [0058].

Furthermore, the Applicants have amended paragraphs [0153], [0155], and [0156] to correct minor typographical errors regarding references to various figures. Lastly, the Applicants have amended paragraphs [0104] and [0108] to correct minor typographical errors. No new matter has been added as a result of these amendments to the specification.

## DRAWINGS

The drawings have been objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include reference signs mentioned in the description, namely the cold plate 52 and the motor 87.

Replacement sheets for Figure 1 and Figure 5 with an annotated sheet showing changes for these two figures have been provided. Figure 1 now shows the reference sign for the cold plate 52 and Figure 5 now shows the reference sign for the motor 87.

## CLAIM OBJECTIONS

Claim 6 has been objected to due to a lack of antecedent basis. Dependent claims 2, 3, and 6 have been amended to clarify the language of the claims and to provide antecedent basis for the term "thick backing window." Furthermore, claim 6 now properly depends from claim 2 instead of claim 1.

## CLAIM REJECTIONS - 103(b)

Claims 1-7, 11, 12, 17, and 19-21 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Wellstood, et al. (U.S. Pat. No. 5,894,220), hereinafter Wellstood I, in view of Wellstood, et al. (U.S. Pat. No. 6,516,281), hereinafter Wellstood II.

Wellstood I discloses a cryogenic device for microscopy which allows positioning of a sample for measurement outside of the vacuum space. The device incorporates a SQUID chip and a sensor sandwiched together. (See Col 4, line 12, Col 5, lines 56-67, and FIG. 4a.) The construction of the device provides for maintenance of the SQUID chip at 77 degrees K. (See Col 4, lines 30-33.)

The Applicants claim "a detection coil being electrically connected to the SQUID sensor." The Applicants' claimed approach includes "a mechanism for



mounting the detection coil at the distal end of the cold finger." Moreover, there is claimed "means for mounting the sensor remotely from the coil."

Instead, Wellstood I discloses a SQUID chip 72 and a SQUID sensor 70 sandwiched together and disposed at the end of a thermally conductive substrate 56. (See FIGS. 1, 2 and 4a, and Col.5, lines 62-64.) Wellstood I only discloses a SQUID chip consisting of a 200 nm-thick layer of  $\text{YBa}^2\text{Cu}_3\text{O}_7$  deposited on a 500  $\mu\text{M}$  thick, 10mm by 10mm  $\text{SrTiO}_3$  24 degree bicrystal substrate.

The Applicants claim "a radiation shield mounted within the dewar." As noted in the Office Action, Wellstood I does not disclose, nor suggest, a "shield."

Wellstood II discloses a system and a method for detecting electric field variations using a Single Electron Transistor (SET). (See abstract.) The Wellstood II device allows cooling of the SET to operate in the 3 to 10 degree K temperature range. (See Col. 4, line 51.) The Wellstood II device incorporates a heat shield surrounding a cold finger. (See FIG. 2.)

Applicant claims "mounting the sensor remotely from the coil." On the other hand, Wellstood II discloses a scanning device using a SET mounted on a cold finger.

Wellstood II clearly teaches away combining these disclosures by stating that detection using an SET combined with a SQUID fails. In the Wellstood II patent it is stated that "a fairly exotic technique such as ... (SQUID) -based magnetic microscopy also fails because it depends on current flow" (See Col. 2, lines 12-15). Thus, there would be no motivation to combine the SQUID device of Wellstood I with the SET having a heat shield as disclosed in Wellstood II.

The Wellstood I disclosure teaches that the SQUID chip must be cooled to 77 degrees K (see Col. 4, lines 30-34). Wellstood I does not suggest cooling to temperatures below 77 degrees K, such as 3 to 10 degree K temperature range as suggested by Wellstood II. (See Col. 4, line 51.) Thus, since Wellstood I does not



require cooler temperatures below 77 degrees K, there would be no motivation to combine Wellstood I with a disclosure such as Wellstood II that provides for lower temperature operations.

Even if the Wellstood I and Wellstood II disclosures were somehow combined, they would not yield the Applicants' claimed approach since the Applicants claim "the extension reducing circular currents in the plane of the detection coil." Wellstood II does not teach, nor suggest, "preventing or reducing circular currents in the plane of the detection coil." Wellstood II only teaches the use of a SET. Since Wellstood II teaches the use of a SET (a transistor), circular currents are not a problem. Thus, there is no suggestion, nor teaching in either Wellstood I or Wellstood II to use an extension which "prevents or reduces circular currents in the plane of the detection coil."

For the foregoing reasons, amended independent claims 1 and 19 and amended dependent claims 2, 3 and 6 patentably distinguish over Wellstood I, either taken alone, or in combination with Wellstood II, or other cited art of record.

Claims 8 and 10 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Wellstood I in view of Wellstood II as applied to claims 1 and 7, and further in view of Wellstood III. Claims 8 and 10 are patentable along with their independent claim 1 as amended for the same reasons as mentioned above in connection with the discussion of claim 1 as amended. Therefore, claims 8 and 10 patentably distinguish over the cited references.

Claim 9 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Wellstood I in view of Wellstood II and Wellstood III as applied to claims 1, 7 and 8, and further in view of Sapir. Claim 9 is patentable along with its independent claim 1 for the same reasons as mentioned above in connection with the discussion of claim 1 as amended. Therefore, claim 9 patentably distinguishes over the cited art of record.

Claims 13, 14 and 18 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Wellstood I in view of Wellstood II as applied to claim 1 above, and further in view of Marooka. Claims 13, 14 and 18 are dependent ultimately from claim 1, and thus claims 13, 14 and 18 are patentable for the same reasons as mentioned above in connection with the discussion of claim 1. Therefore, claims 13, 14 and 18 patentably distinguish over the cited art of record.

Claim 15 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Wellstood I in view of Wellstood II as applied to claim 1, and further in view of Wikswo. Claim 15 depends ultimately from claim 1, and thus claim 15 is patentable along with claim 1 for the same reasons as mentioned above in connection with the discussion of claim 1 as amended. Therefore, claim 15 patentably distinguishes over the cited art of record.

Claim 16 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Wellstood I in view of Wellstood II as applied to claim 1, and further in view of Tsukada. Claim 16 ultimately depends from claim 1, and therefore claim 16 is patentable along with claim 1 for the same reasons as mentioned above in connection with the discussion of claim 1 as amended. Therefore, claim 16 patentably distinguishes over the cited art of record.

Furthermore, all of the patents cited in the last Office Action have been reviewed, and it is believed that the claims patentably distinguish thereover.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

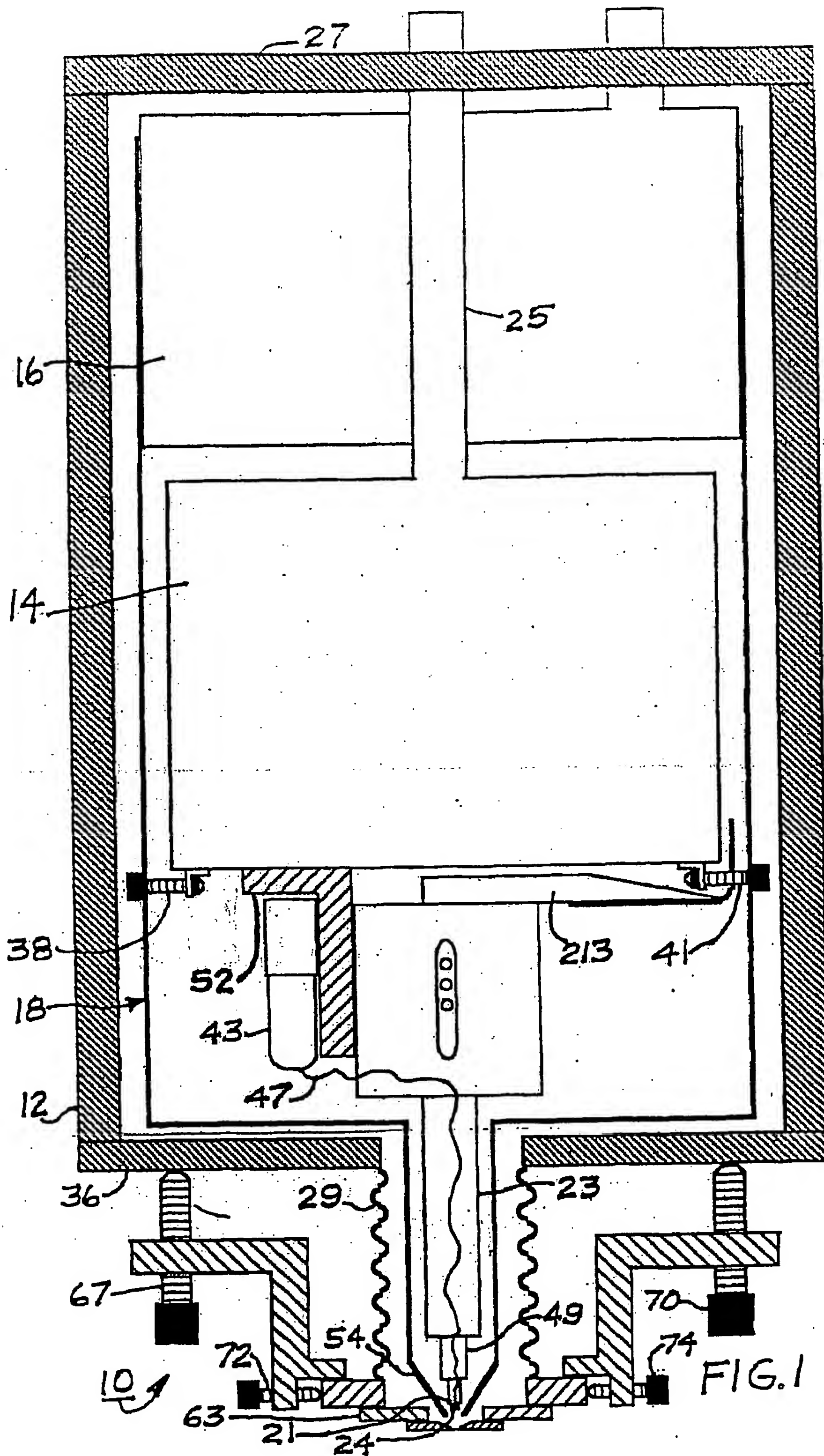
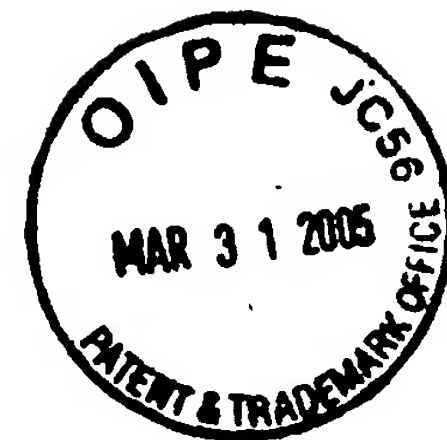
By: 

Bernard L. Kleinke  
Attorney for Applicant  
Registration No. 22,123

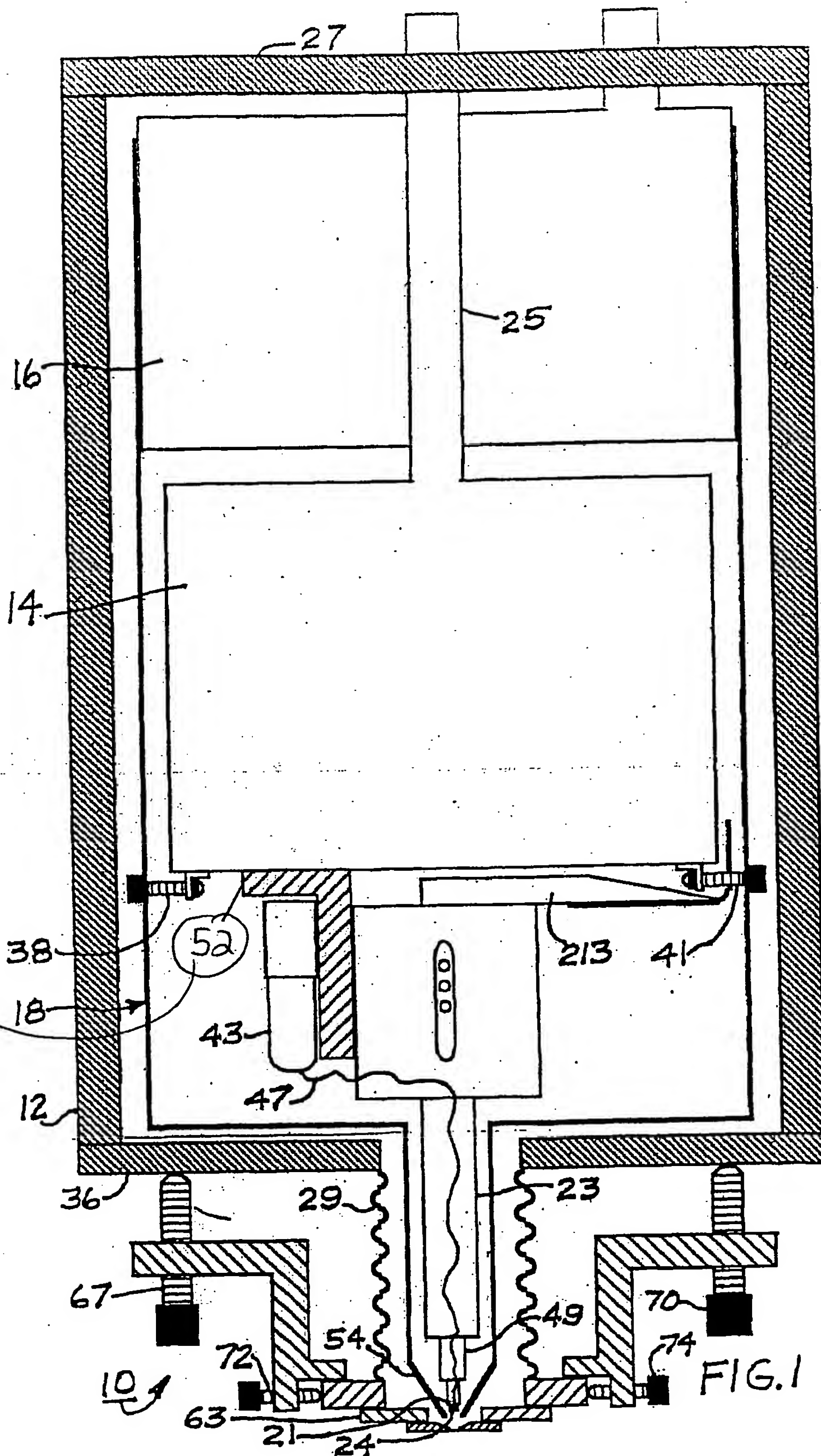
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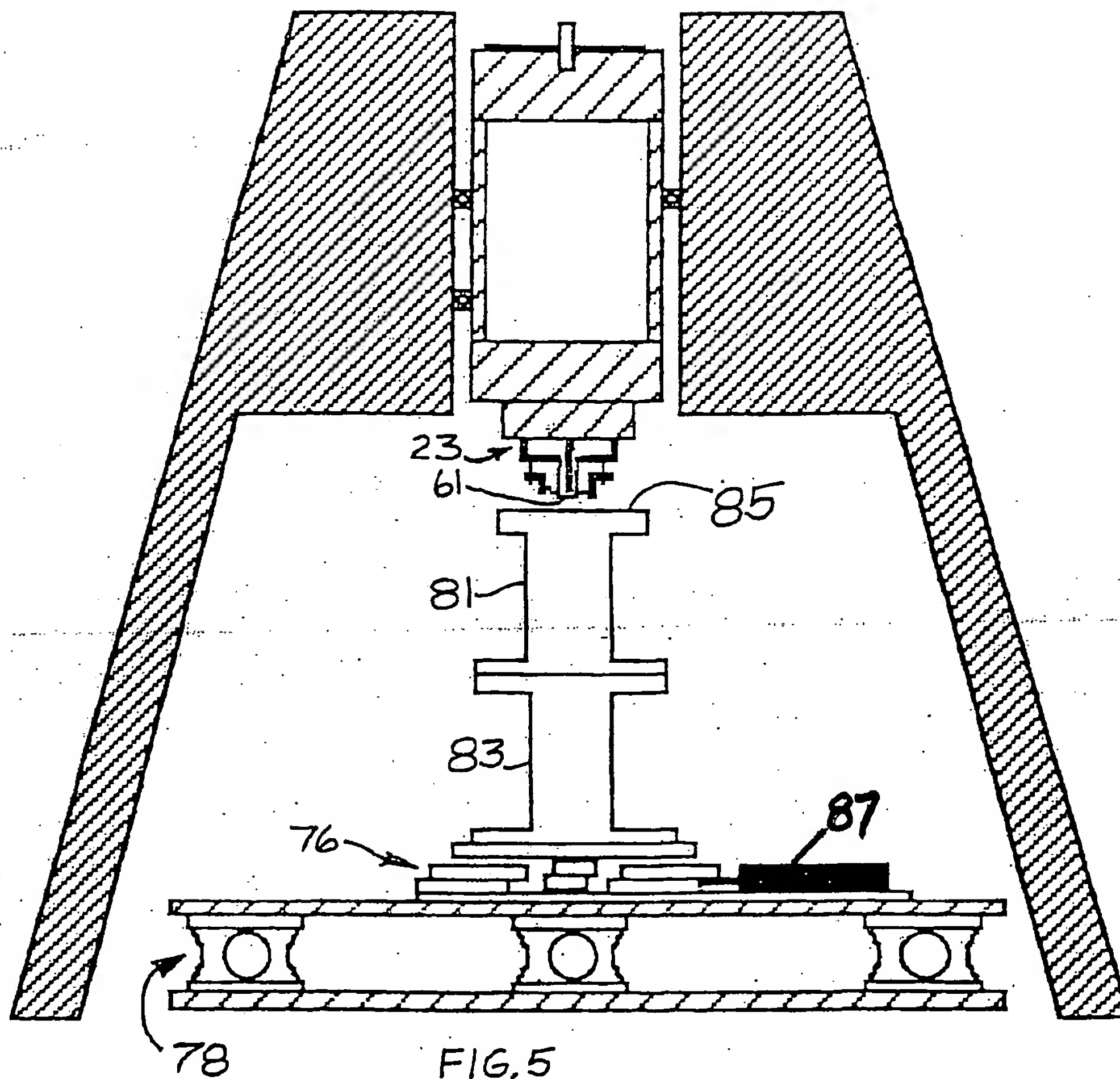
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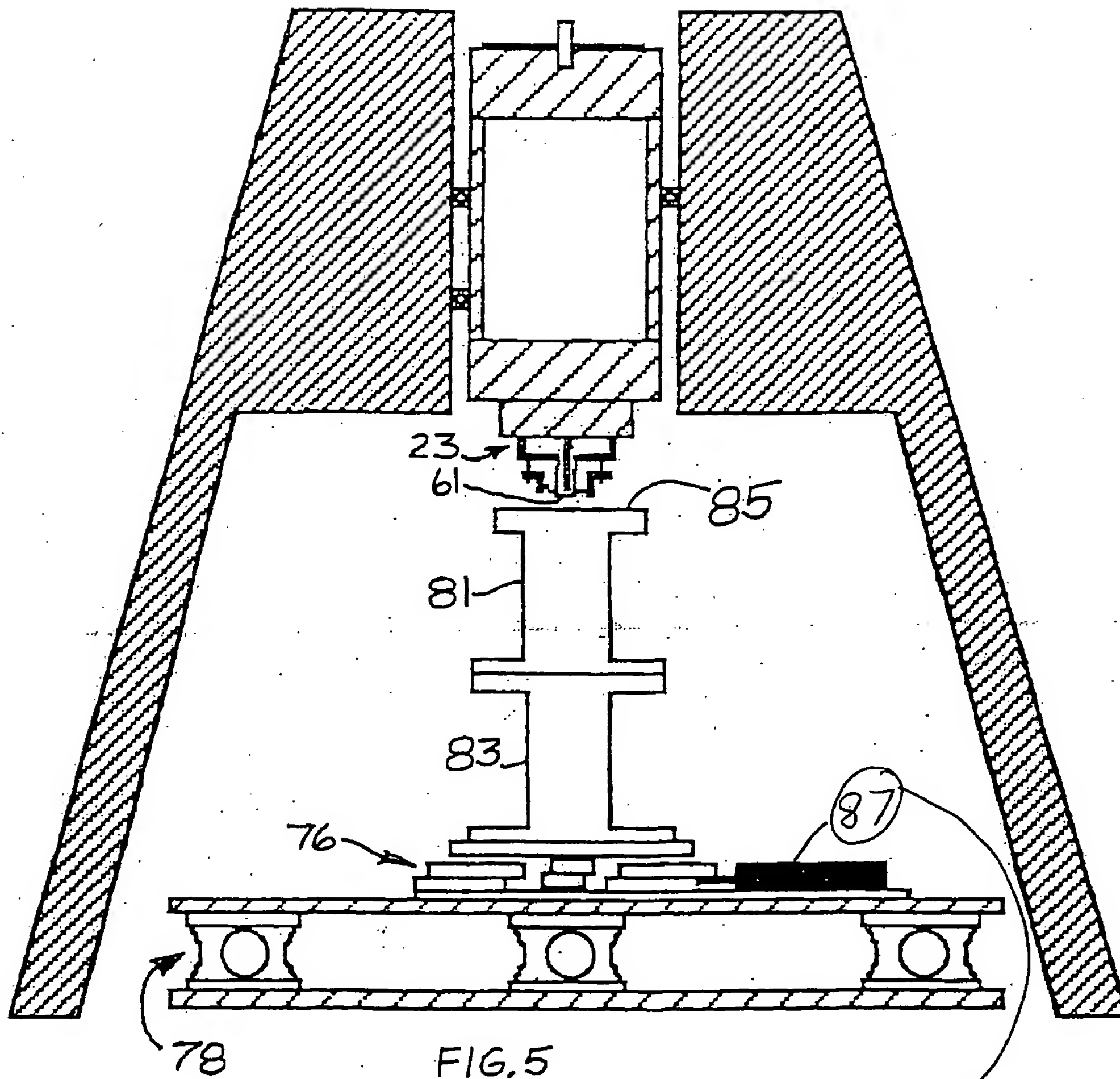
Element 52  
added to the  
drawings.











Element 87  
added to the  
drawings.



App. No. 10/650,263  
Amdt. Dated February 8, 2005  
Reply to Office Action of December 12, 2004  
Atty. Dkt. No. 9278-100 (formerly 9129-111)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Baudenbacher, et al.

Title: SUPERCONDUCTING QUANTUM  
INTERFERENCE APPARATUS AND  
METHOD FOR HIGH RESOLUTION  
IMAGING OF SAMPLES

Appl. No.: 10/650,263

Filing Date: August 27, 2003

Examiner: Kenneth J. Whittington

Art Unit: 2862

<p><b>CERTIFICATE OF FIRST CLASS MAILING</b></p> <p>I hereby certify that this correspondence is being deposited with the United States Postal Service, as First Class Mail on the date indicated below and is addressed to: Commissioner for Patents, P.O. BOX 1450, Alexandria, VA 22313-1450.</p> <p><u>3/8/05</u> Date of Deposit)</p> <p>Bernard L. Kleinke (Printed Name)</p> <p><u>Bernard L. Kleinke</u> (Signature)</p>
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**INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.56**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Submitted herewith on Form PTO/SB/08 is a listing of documents known to Applicants in order to comply with Applicants' duty of disclosure pursuant to 37 CFR § 1.56. A copy of each listed document is being submitted to comply with the provisions of 37 CFR §§1.97 and 1.98.

The submission of any document herewith, which is not a statutory bar, is not intended as an admission that such document constitutes prior art against the claims of the present Application or that such document is considered material to patentability as defined in 37 CFR § 1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference

any document which is determined to be a *prima facie* art reference against the claims of the present Application.

**TIMING OF THE DISCLOSURE**

The listed documents are being submitted in compliance with 37 CFR § 1.97(b), before the mailing date of any of a final action under § 1.113, a notice of allowance under § 1.311, or an action that otherwise closes prosecution in the application, and it is accompanied by the fee set forth in § 1.17(p).

**RELEVANCE OF EACH DOCUMENT**

The relevance of the documents is described in the present specification. All of the documents are in English. Applicants respectfully request that any listed documents be considered by the Examiner and be made of record in the present Application and that any initial copy of Form PTO/SB/08 be returned in accordance with MPEP § 609.

**PETITION AND FEE**

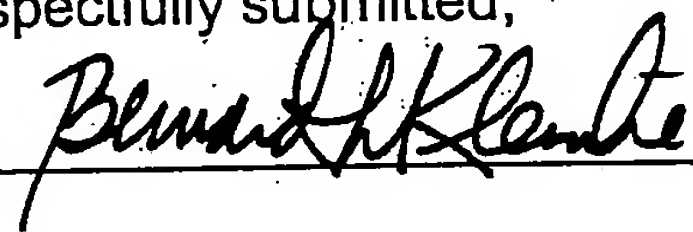
It is hereby respectfully petitioned that the attached listed documents be considered by the Examiner and formally made of record. A petition fee in the amount of \$180.00 in accordance with 37 CFR § 1.17(l) is enclosed.

Date: March 8, 2005

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Respectfully submitted,

By



Bernard L. Kleinke  
Attorney for Applicant  
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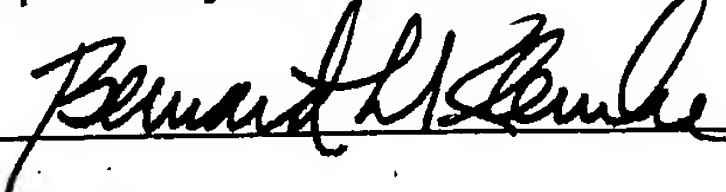
**AUTHORIZATION TO PAY AND PETITION FOR THE  
ACCEPTANCE OF ANY NECESSARY FEES**

The Commissioner is hereby authorized to charge any additional fees which may be required either now or in the future regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. If any charges or fees must be paid in connection with the foregoing, concurrent or future communication (including, but not limited to, the payment of an extension fee or issue fees), or if any overpayment is to be refunded in connection with the above-identified application, any such charges or fees, or any such overpayment may be respectfully paid out of, or into, the Deposit Account No. 502635 of DUCKOR SPRADLING METZGER & WYNNE. If any such payment also requires a petition or extension request, please construe this authorization to pay as the necessary petition or request, which is required to accompany the payment.

Date: March 8, 2005

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Respectfully submitted,

By 

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